Biotechnology and Bioengineering

Editor

Douglas S. Clark

Department of Chemical Engineering, University of California
201 Gilman Hall, Berkeley, CA 94720-1462

Associate Editors

James D. Bryers
University of Connecticut
Farmington, Connecticut

Pauline Doran
University of New South Wales
Sydney, Australia

Jonathan S. Dordick
Rensselaer Polytechnic Institute
Troy, New York

George Georgiou
University of Texas
Austin, Texas

Jeffrey A. Hubbell
ETH—Zürich and
University of Zürich
Zürich, Switzerland

Maria-Regina Kula
Heinrich-Heine Universität
Düsseldorf
in der KFA Jülich, Germany

Lee R. Lynd
Dartmouth College
Hanover, New Hampshire

Tadashi Matsunaga
Tokyo University of Agriculture and Technology
Tokyo, Japan

Eleftherios T. Papoutsakis
Northwestern University
Evanston, Illinois

John Villadsen
Technical University of Denmark
Lyngby, Denmark

Editorial Board

James E. Bailey
ETH–Zürich
Zürich, Switzerland

Harvey W. Blanch
University of California
Berkeley, California

Isao Karube
University of Tokyo
Tokyo, Japan

Alexander M. Klibanov
Massachusetts Institute of Technology
Cambridge, Massachusetts

Bernhard Ø. Palsson
University of California at San Diego
La Jolla, California

Michael L. Shuler
Cornell University
Ithaca, New York

Daniel I.C. Wang
Massachusetts Institute of Technology
Cambridge, Massachusetts

Founding Editor: Elmer L. Gaden, Jr., *University of Virginia, Charlottesville, Virginia*

Biotechnology and Bioengineering (ISSN: 0006-3592) Volumes 62–66 are published 28 times a year, semi-monthly, except tri-monthly in February, May, August, and November, by John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158.

Copyright © 1999 John Wiley & Sons, Inc. All rights reserved. No part of this publication may be reproduced in any form or by any means, except as permitted under section 107 or 108 of the 1976 United States Copyright Act, without written permission of the publisher; authorization through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, 508-750-8400, fax (508) 750-4470. Periodicals postage paid at New York, NY, and at additional mailing offices. The Combinatorial Chemistry section, vol. 61 (1–4), will be sent via standard mail.

The code and copyright notice appearing at the bottom of the first page of an item in the journal indicates the copyright holder's consent that copies may be made for personal or internal use, or for the personal or internal use of specific clients, on the condition that the copier pay for copying beyond that permitted by Sections 107 and 108 of the United States Copyright Law. The per copy fee for each item is to be paid through the Copyright Clearance Center. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale. Such permission requests and other permission inquiries should be addressed to the Permissions Dept.

Subscription Price (Volumes 62–66, 1999): $3195.00 in US, $3475.00 in Canada and Mexico, $3713.00 outside North America. All subscriptions outside US will be sent by air. Personal rate: $525.00 in US, and $693.00 outside North America. *Combinatorial Chemistry* section personal rate: $145.00 in US, and $169.00 outside North America. Subscriptions at the personal rate are available to individuals. Payment must be made in US dollars drawn on a US bank. Claims for undelivered copies will be accepted only after the following issue has been received. Please enclose a copy of the mailing label. Missing copies will be supplied when losses have been sustained in transit and where reserve stock permits. Please allow four weeks for processing a change of address. For subscription inquiries, please call (212) 850-6645, E-mail: SUBINFO@wiley.com

Postmaster: Send address changes to Biotechnology and Bioengineering, Caroline Rothaug, Director, Subscription Fulfillment and Distribution, John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158.

Advertising Sales: Inquiries concerning advertising should be forwarded to Advertising Sales, John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158, (212) 850-8832. Advertising Sales, European Contacts: Bob Kern or Nicky Douglas, John Wiley & Sons, Ltd., Baffins Lane, Chichester, West Sussex PO19 1UD, England. Tel: 44 1243 770 350/367, Fax: 44 1243 770 432, e-mail: adsales@wiley.co.uk.

Reprints: Reprint sales and inquiries should be directed to the Customer Service Department, John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158. Tel: (212) 850-8776.

Manuscripts for *Biotechnology & Bioengineering* should be submitted to the Editor, Professor Douglas S. Clark, Dept. of Chemical Engineering, University of California, 201 Gilman Hall, Berkeley, CA 94720-1462. **Manuscripts** for *Combinatorial Chemistry* should be submitted to the Editor, Dr. David J. Ecker, Isis Pharmaceuticals, Inc., 2292 Faraday Avenue, Carlsbad, CA 92008.

All Other Correspondence: Address to Biotechnology and Bioengineering, Publisher, Interscience Division, Professional, Reference, and Trade Group, John Wiley & Sons, Inc., 605 Third Ave., New York, NY 10158.

Information for Contributors appears in the first and last issue of each volume. The contents of this journal are indexed or abstracted in Biological Abstracts, BIOSIS, Chemical Abstracts, Chemical Titles, Current Contents/Life Sciences, Current Contents/Agriculture Biology, and Environmental Science, Engineering Index, Excerpta Medica, Reference Update, Research Alert (ISI), Science Citation Index (ISI), SCISEARCH Database (ISI), and Index Medicus/MEDLINE.

Editorial Production, John Wiley
Diane Gern

This paper meets the requirement of ANSI/NISO Z39.48-1992 (Permanence of Paper)

Biotechnology and Bioengineering

Author Index to Volume 63

Acuña, M.E.
—; Pérez, F.; Auria, R.; Revah, S.: Microbiological and Kinetic Aspects of a Biofilter for the Removal of Toluene from Waste Gases, 175
Agrawal, R.
—; Deepika, N.-U.-A.; Joseph, R.: Strain Improvement of *Aspergillus* Sp. and *Penicillium* Sp. by Induced Mutation for Biotransformation of α-Pinene to Verbenol, 249
Ahring, B.K. See Angelidaki, I., 363
Aldaz, A. See López-López, A., 79
Allan, V.J.M. See Finlay, J.A., 87
Alves, S.S. See Mateus, D.M.R., 625
Ameer, G.A.
—; Raghavan, S.; Sasisekharan, R.; Harmon, W.; Cooney, C.L.; Langer, R.: Regional Heparinization Via Simultaneous Separation and Reaction in a Novel Taylor-Couette Flow Device, 618
Angelidaki, I.
—; Ellegaard, L.; Ahring, B.K.: A Comprehensive Model of Anaerobic Bioconversion of Complex Substrates to Biogas, 363
Antón, J. See López-López, A., 79
Araujo, M.L.G.C.
—; Giordano, R.C.; Hokka, C.O.: Studies on the Respiration Rate of Free and Immobilized Cells of *Cephalosporium acremonium* in Cephalosporin C Production, 593
Archambault, J. See Jolicoeur, M., 224
Aristidou, A.A.
—; San, K.-Y.; Bennett, G.N.: Metabolic Flux Analysis of *Escherichia coli* Expressing the *Bacillus subtilis* Acetolactate Synthase in Batch and Continuous Cultures, 737
Asbóth, B. See Sasvári, Z., 459
Auria, R. See Acuña, M.E., 175

Bailey, J.E. See Kaufmann, H., 573
Baines, A.J. See Hooker, A.D., 559
Balcarcel, R.R. See Follstad, B.D., 675
Basnakova, G. See Finlay, J.A., 87
Bédard, C. See Zeiser, A., 122
Beeftink, H.H. See Marchal, L.M., 344
Beenackers, A.A.C.M. See Sipkema, E.M., 56
Behie, L.A. See Kallos, M.S., 473
Bennett, G.N. See Aristidou, A.A., 737
Bently, W.E. See Hu, Y.-C., 721
Bergsma, J. See Marchal, L.M., 344
Beuse, M.
—; Kopmann, A.; Diekmann, H.; Thoma, M.: Oxygen, pH Value, and Carbon Source Induced Changes of the Mode of Oscillation in Synchronous Continuous Culture of *Saccharomyces cerevisiae*, 410
Blackall, L.L. See Bond, P.L., 507
Boam, A.T. See Doig, S.D., 601
Bond, P.L.
—; Keller, J.; Blackall, L.L.: Anaerobic Phosphate Release from Activated Sludge with Enhanced Biological Phosphorus Removal. A Possible Mechanism of Intracellular pH Control, 507
Bou, J.J. See Pérez-Camero, G., 110
Boudrant, J. See Gschaedler, A., 712
Boures, E. See Bousquet, M.-P., 730
Bousquet, M.-P.
—; Willemot, R.-M.; Monsan, P.; Boures, E.: Enzymatic Synthesis of Unsaturated Fatty Acid Glucoside Esters for Dermo-Cosmetic Applications, 730
Bramble, J. See Muzzio, F.J., 185
Branlant, C. See Gschaedler, A., 712
Brühlmann, F.
—; Chen, W.: Tuning Biphenyl Dioxygenase for Extended Substrate Specificity, 544
Buchholz, K. See Dols, M., 308
Bull, A.T. See Hooker, A.D., 559

Callow, M.E. See Finlay, J.A., 87
Carbonell, R.G. See Huang, P.Y., 633
Carpenter, J.F. See Heller, M.C., 166
Carrier, R.L. See Obradovic, B., 197
Chang, H.N. See Park, J.K., 116
Chavarie, C. See Jolicoeur, M., 224
Chen, W. See Brühlmann, F., 544
—; See Mulchandani, A., 216
Chou, C.P.
—; Yu, C.-C.; Tseng, J.-H.; Lin, M.-I.; Lin, H.-K.: Genetic Manipulation to Identify Limiting Steps and Develop Strategies for High-Level Expression of Penicillin Acylase in *Escherichia coli*, 263
Christiansen, T.
—; Spohr, A.B.; Nielsen, J.: On-Line Study of Growth Kinetics of Single Hyphae of *Aspergillus oryzae* in a Flow-Through Cell, 147
Cicek, M.
—; Esen, A.: Expression of Soluble and Catalytically Active Plant (Monocot) β-Glucosidases in *E. coli*, 392
Clapés, P.
—; Morán, C.; Infante, M.R.: Enzymatic Synthesis of Arginine-Based Cationic Surfactants, 333
Clark, D.S. See Ru, M.T., 233
Clonis, Y.D. See Labrou, N.E., 322
Congregado, F. See Pérez-Camero, G., 110
Conner, A. See Finlay, J.A., 87
Converti, A. See Palazzi, E., 273
Cooney, C.L. See Ameer, G.A., 618
Coughlin, R.W. See Schreyer, H.B., 129

da Fonseca, M.M.R. See Mateus, D.M.R., 625
Dahlems, U. See Mayer, A.F., 373
Davis, H.E. See Le Doux, J.M., 654
de Koning, W. See Sipkema, E.M., 56
de Sousa, P.C., Jr. See Foguel, D., 552
Deepika, N.-U.-A. See Agrawal, R., 249
Demuth, B. See Dols, M., 308
Dexheimer, J. See Oerther, S., 206
Diekmann, H. See Beuse, M., 410
Doig, S.D.
—; Boam, A.T.; Livingston, A.G.; Stuckey, D.C.: Epoxidation of 1,7-Octadiene by *Pseudomonas oleovorans* in a Membrane Bioreactor, 601
Dols, M.
—; Remaud-Simeon, M.; Willemot, R.-M.; Demuth, B.; Jördening, H.-J.; Buchholz, K.; Monsan, P.: Kinetic Modeling of Oligosaccharide Synthesis Catalyzed by *Leuconostoc mesenteroides* NRRL B-1299 Dextransucrase, 308
Donaldson, M.
—; Wood, H.A.; Kulakosky, P.C.; Shuler, M.L.: Glycosylation of a Recombinant Protein in the Tn5B1-4 Insect Cell Line: Influence of Ammonia, Time of Harvest, Temperature, and Dissolved Oxygen, 255
Dordick, J.S. See Ru, M.T., 233
dos Santos, V.A.P.M. See Hellendoorn, L., 694
Dowd, J.E.
—; Weber, I.; Rodriguez, B.; Piret, J.M.; Kwok, K.E.: Predictive Control of Hollow-Fiber Bioreactors for the Production of Monoclonal Antibodies, 484

Eaves, C.J. See Zandstra, P.W., 493
Edwards, G.H. See Hu, Y.-C., 721
Eliopoulos, E. See Labrou, N.E., 322
Ellegaard, L. See Angelidaki, I., 363
Erbeldinger, M.
—; Ni, X.; Halling, P.J.: Kinetics of Enzymatic Solid-to-Solid Peptide Synthesis: Intersubstrate Compound, Substrate Ratio, and Mixing Effects, 316
Ergas, S.J.
—; Shumway, L.; Fitch, M.W.; Neemann, J.J.: Membrane Process for Biological Treatment of Contaminated Gas Streams, 431
Esen, A. See Cicek, M., 392
Expósito, E. See López-López, A., 79

Fahnestock, P. See Muzzio, F.J., 185
Fann, C.H.
—; Guarna, M.M.; Kilburn, D.G.; Piret, J.M.: Relationship Between Recombinant Activated Protein C Secretion Rates and mRNA Levels in Baby Hamster Kidney Cells, 464
Ferrasson, E. See Michon, T., 449

Fiefler, R.G. See Smets, B.F., 642
Finlay, J.A.
—; Allan, V.J.M.; Conner, A.; Callow, M.E.; Basnakova, G.; Macaskie, L.E.: Phosphate Release and Heavy Metal Accumulation by Biofilm-Immobilized and Chemically-Coupled Cells of a *Citrobacter* sp. Pre-Grown in Continuous Culture, 87
Fitch, M.W. See Ergas, S.J., 431
Foguel, D.
—; Robinson, C.R.; de Sousa, P.C., Jr.; Silva, J.L.; Robinson, A.S.: Hydrostatic Pressure Rescues Native Protein from Aggregates, 552
Follstad, B.D.
—; Balcarcel, R.R.; Stephanopoulos, G.; Wang, D.I.C.: Metabolic Flux Analysis of Hybridoma Continuous Culture Steady State Multiplicity, 675
Fortin, J.A. See Jolicoeur, M., 224
Freed, L.E. See Obradovic, B., 197
Fregapane, G.
—; Rubio-Fernández, H.; Nieto, J.; Salvador, M.D.: Wine Vinegar Production Using a Noncommercial 100-Litre Bubble Column Reactor Equipped with a Novel Type of Dynamic Sparger, 141
Fujikawa, S. See Higashiyama, K., 442
Fussenegger, M. See Kaufmann, H., 573

Ganzeveld, K.J. See Sipkema, E.M., 56
Gervais, C. See Mercille, S., 516
Giordano, R.C. See Araujo, M.L.G.C., 593
Gladden, S.G. See Saarinen, M.A., 612
Goetheer, E. See Marchal, L.M., 344
Grage, H. See Palmqvist, E., 46
Green, N.H. See Hooker, A.D., 559
Gschaedler, A.
—; Robas, N.; Boudrant, J.; Branlant, C.: Effects of Pulse Addition of Carbon Sources On Continuous Cultivation of *Escherichia coli* Containing a Recombinant *E. coli gapA* Gene, 712
Guarna, M.M. See Fann, C.H., 464
Guéguen, J. See Michon, T., 449

Hahn-Hägerdal, B. See Palmqvist, E., 46
Halling, P.J. See Erbeldinger, M., 316
Harmon, W. See Ameer, G.A., 618
Haynes, C.A. See Zandstra, P.W., 493
Hellendoorn, L.
—; Ottengraf, S.P.P.; van den Heuvel, J.C.; Pennings, J.A.M.M.; dos Santos, V.A.P.M.; Wijffels, R.H.: Kinetics and Performance of a Co-Immobilised System of Amyloglucosidase and *Zymomonas mobilis*, 694
Heller, M.C.
—; Carpenter, J.F.; Randolph, T.W.: Protein Formulation and Lyophilization Cycle Design: Prevention of Damage Due to Freeze-Concentration Induced Phase Separation, 166
Hellmuth, K. See Mayer, A.F., 373
Hewitt, C.J.
—; Nebe-Von Caron, G.; Nienow, A.W.; McFarlane, C.M.: Use of Multi-Staining Flow Cytometry to Characterise the Physiological State of *Escherichia coli* W3110 in High Cell Density Fed-Batch Cultures, 705
Higashiyama, K.
—; Murakami, K.; Tsujimura, H.; Matsumoto, N.; Fujikawa, S.: Effects of Dissolved Oxygen on the Morphology of an Arachidonic Acid Production by *Mortierella alpina* 1S-4, 442
Hill, C.G., Jr. See Rice, K.E., 33
Hoare, M. See Tsoka, S., 290
—; See Yeung, K.S.Y., 684
Hokka, C.O. See Araujo, M.L.G.C., 593
Holwill, I. See Tsoka, S., 290
Hooker, A.D.
—; Green, N.H.; Baines, A.J.; Bull, A.T.; Jenkins, N.; Strange, P.G.; James, D.C.: Constraints on the Transport and Glycosylation of Recombinant IFN-γ in Chinese Hamster Ovary and Insect Cells, 559
Hu, Y.-C.
—; Bently, W.E.; Edwards, G.H.; Vakharia, V.N.: Chimeric Infectious Bursal Disease Virus-Like Particles Expressed in Insect Cells and Purified by Immobilized Metal Affinity Chromatography, 721
Huang, P.Y.
—; Carbonell, R.G.: Affinity Chromatographic Screening of Soluble Combinatorial Peptide Libraries, 633
Hubert, P. See Oerther, S., 206

Infante, M.R. See Clapés, P., 333
Ingle, J.D., Jr. See Stuart, S.L., 69
Iyer, M.S.
—; Wiesner, T.F; Rhinehart, R.R.: Dynamic Reoptimization of a Fed-Batch Fermentor, 10

James, D.C. See Hooker, A.D., 559
Janssen, D.B. See Sipkema, E.M., 56
Jaouen, P. See Vandanjon, L., 1
Jardin, B. See Zeiser, A., 122
Jenkins, N. See Hooker, A.D., 559
Jensen, N.B.S.
—; Jokumsen, K.V.; Villadsen, J.: Determination of the Phosphorylated Sugars of the Embden-Meyerhoff-Parnas Pathway in *Lactococcus lactis* Using a Fast Sampling Technique and Solid Phase Extraction, 356
Jervis, E. See Zandstra, P.W., 493
Jin, Y.B. See Park, J.K., 116
Johns, M.R. See Stuart, D.M., 383
Jokumsen, K.V. See Jensen, N.B.S., 356
Jolicoeur, M.
—; Williams, R.D.; Chavarie, C.; Fortin, J.A.; Archambault, J.: Production of *Glomus intraradices* Propagules, an Arbuscular Mycorrhizal Fungus, in an Airlift Bioreactor, 224
Jolicoeur, P. See Mercille, S., 516
Jördening, H.-J. See Dols, M., 308
Joseph, R. See Agrawal, R., 249

Kallos, M.S.
—; Behie, L.A.: Inoculation and Growth Conditions for High-Cell-Density Expansion of Mammalian Neural Stem Cells in Suspension Bioreactors, 473
Kamen, A.A. See Zeiser, A., 122
Kaneva, I. See Mulchandani, A., 216
Kaufmann, H.
—; Mazur, X.; Fussenegger, M.; Bailey, J.E.: Influence of Low Temperature on Productivity, Proteome and Protein Phosphorylation of CHO Cells, 573
Keller, J. See Bond, P.L., 507
Kilburn, D.G. See Fann, C.H., 464
—; See Zandstra, P.W., 493
Klibanov, A.M. See Knubovets, T., 242
Knubovets, T.
—; Osterhout, J.J.; Klibanov, A.M.: Structure of Lysozyme Dissolved in Neat Organic Solvents as Assessed by NMR and CD Spectroscopies, 242
Kopmann, A. See Beuse, M., 410
Kroner, K.-H. See Vogel, J.H., 663
Kulakosky, P.C. See Donaldson, M., 255
Kumar, G.
—; Smith, P.J.; Payne, G.F.: Enzymatic Grafting of a Natural Product onto Chitosan to Confer Water Solubility Under Basic Conditions, 154
Kwok, K.E. See Dowd, J.E., 484

Labrou, N.E.
—; Eliopoulos, E.; Clonis, Y.D.: Molecular Modeling for the Design of a Biomimetic Chimeric Ligand. Application to the Purification of Bovine Heart L-Lactate Dehydrogenase, 322
Langer, R. See Ameer, G.A., 618
Lapicque, F. See Oerther, S., 206
Lapicque, F. See Oerther, S., 206
Lazarova, Z.
—; Tonova, K.: Integrated Reversed Micellar Extraction and Stripping of α-Amylase, 583
Le Doux, J.M.
—; Davis, H.E.; Morgan, J.R.; Yarmush, M.L.: Kinetics of Retrovirus Production and Decay, 654
Le Gall, H. See Oerther, S., 206
Lemmon, T.L. See Stuart, S.L., 69
Lendenmann, U. See Smets, B.F., 642
Lin, H.-K. See Chou, C.P., 263
Lin, M.-I. See Chou, C.P., 263
Litster, J.D. See Stuart, D.M., 383
Liu, M. See Muzzio, F.J., 185
Livingston, A.G. See Doig, S.D., 601
Lobo, R.
—; Revah, S.; Viveros-García, T.: An Analysis of a Trickle-Bed Bioreactor: Carbon Disulfide Removal, 98
Lopez-Ulibarri, R. See Mayer, A.F., 373
Lortie, R. See Pepin, P., 502
López-López, A.
—; Expósito, E.; Antón, J.; Rodríguez-Valera, F.; Aldaz, A.: Use of *Thiobacillus ferrooxidans* in a Coupled

Microbiological–Electrochemical System for Wastewater Detoxification, 79

Macaskie, L.E. See Finlay, J.A., 87
Marchal, L.M.
—; van de Laar, A.M.J.; Goetheer, E.; Schimmelpennink, E.B.; Bergsma, J.; Beeftink, H.H.; Tramper, J.: Effect of Temperature on the Saccharide Composition Obtained after α-Amylolysis of Starch, 344
Massie, B. See Mercille, S., 516
—; See Mercille, S., 529
Mateus, D.M.R.
—; Alves, S.S.; da Fonseca, M.M.R.: Diffusion in Cell-Free and Cell Immobilising κ-Carrageenan Gel Beads with and without Chemical Reaction, 625
Matheson, N.H. See Noronha, S.B., 285
Matsumoto, N. See Higashiyama, K., 442
Mayer, A.F.
—; Hellmuth, K.; Schlieker, H.; Lopez-Ulibarri, R.; Oertel, S.; Dahlems, U.; Strasser, A.W.M.; van Loon, A.P.G.M.: An Expression System Matures: A Highly Efficient and Cost-Effective Process for Phytase Production by Recombinant Strains of *Hansenula polymorpha*, 373
Mazur, X. See Kaufmann, H., 573
McFarlane, C.M. See Hewitt, C.J., 705
Meinander, N.Q. See Palmqvist, E., 46
Menon, M.K.
—; Zydney, A.L.: Effect of Ion Binding on Protein Transport through Ultrafiltration Membranes, 298
Mercille, S.
—; Jolicoeur, P.; Gervais, C.; Paquette, D.; Mosser, D.D.; Massie, B.: Dose-Dependent Reduction of Apoptosis in Nutrient-Limited Cultures of NS/0 Myeloma Cells Transfected with the E1B-19K Adenoviral Gene, 516
—; Massie, B.: Apoptosis-Resistant E1B-19K-Expressing NS/0 Myeloma Cells Exhibit Increased Viability and Chimeric Antibody Productivity under Perfusion Culture Conditions, 529
Michon, T.
—; Wang, W.; Ferrasson, E.; Guéguen, J.: Wheat Prolamine Crosslinking Through Dityrosine Formation Catalyzed by Peroxidases: Improvement in the Modification of a Poorly Accessible Substrate by "Indirect" Catalysis, 449
Misawa, N. See Verdoes, J.C., 750
Mitchell, D.A. See Stuart, D.M., 383
Mitchell-Logean, C.M. See Saarinen, M.A., 612
Monsan, P. See Bousquet, M.-P., 730
—; See Dols, M., 308
Morán, C. See Clapés, P., 333
Morgan, J.R. See Le Doux, J.M., 654
Mosser, D.D. See Mercille, S., 516
Mulchandani, A.
—; Kaneva, I.; Chen, W.: Detoxification of Organophosphate Nerve Agents by Immobilized *Escherichia coli* with Surface-Expressed Organophosphorus Hydrolase, 21
Muñoz-Guerra, S. See Pérez-Camero, G., 110 6
Murakami, K. See Higashiyama, K., 442
Murhammer, D.W. See Saarinen, M.A., 612
Mutharasan, R. See Tatiraju, S., 22
Muzzio, F.J.
—; Unger, D.R.; Liu, M.; Bramble, J.; Searles, J.; Fahnestock, P.: Computational and Experimental Investigation of Flow and Particle Settling in a Roller Bottle Bioreactor, 185

Nebe-Von Caron, G. See Hewitt, C.J., 705
Neemann, J.J. See Ergas, S.J., 431
Netter, P. See Oerther, S., 206
Ni, X. See Erbeldinger, M., 316
Nielsen, J. See Christiansen, T., 147
Nienow, A.W. See Hewitt, C.J., 705
Nieto, J. See Fregapane, G., 141
Noronha, S.B.
—; Wagner, L.W.; Matheson, N.H.; Shiloach, J.: Use of an Ethanol Sensor for Feedback Control of Growth and Expression of TBV25H in *Saccharomyces cerevisiae*, 285

Obradovic, B.
—; Carrier, R.L.; Vunjak-Novakovic, G.; Freed, L.E.: Gas Exchange is Essential for Bioreactor Cultivation of Tissue Engineered Cartilage, 197
Oertel, S. See Mayer, A.F., 373
Oerther, S.
—; Le Gall, H.; Payan, E.; Lapicque, F.; Presle, N.; Hubert, P.; Dexheimer, J.; Netter, P.; Lapicque, F.: Hyaluronate-Alginate Gel as a Novel Biomaterial: Mechanical Properties and Formation Mechanism, 206
Okkerse, M. See Okkerse, W.J.H., 418
Okkerse, W.J.H.
—; Ottengraf, S.P.P.; Osinga-Kuipers, B.; Okkerse, M.: Biomass Accumulation and Clogging in Biotrickling Filters for Waste Gas Treatment. Evaluation of a Dynamic Model Using Dichloromethane as a Model Pollutant, 418
Osinga-Kuipers, B. See Okkerse, W.J.H., 418
Osterhout, J.J. See Knubovets, T., 242
Ottengraf, S.P.P. See Hellendoorn, L., 694
—; See Okkerse, W.J.H., 418

Palazzi, E.
—; Converti, A.: Generalized Linearization of Kinetics of Glucose Isomerization to Fructose by Immobilized Glucose Isomerase, 273
Palmqvist, E.
—; Grage, H.; Meinander, N.Q.; Hahn-Hägerdal, B.: Main and Interaction Effects of Acetic Acid, Furfural, and *p*-Hydroxybenzoic Acid on Growth and Ethanol Productivity of Yeasts, 46
Paquette, D. See Mercille, S., 516
Park, J.K.
—; Jin, Y.B.; Chang, H.N.: Reusable Biosorbents in Capsules from *Zoogloea ramigera* Cells for Cadmium Removal, 116
Payan, E. See Oerther, S., 206
Payne, G.F. See Kumar, G., 154
Pennings, J.A.M.M. See Hellendoorn, L., 694
Pepin, P.
—; Lortie, R.: Influence of Water Activity on the Enantioselective Esterification of (*R,S*)-Ibuprofen by *Candida antarctica* Lipase B in Solventless Media, 502
Pérez, F. See Acuña, M.E., 175
Pérez-Camero, G.
—; Congregado, F.; Bou, J.J.; Muñoz-Guerra, S.: Biosynthesis and Ultrasonic Degradation of Bacterial Poly(γ-Glutamic Acid), 110
Piret, J.M. See Dowd, J.E., 484
—; See Fann, C.H., 464
—; See Zandstra, P.W., 493
Presle, N. See Oerther, S., 206

Quéméneur, F. See Vandanjon, L., 1

Raghavan, S. See Ameer, G.A., 618
Randolph, T.W. See Heller, M.C., 166
Reimer, J.A. See Ru, M.T., 233
Remaud-Simeon, M. See Dols, M., 308
Revah, S. See Acuña, M.E., 175
—; See Lobo, R., 98
Rhinehart, R.R. See Iyer, M.S., 10
Rice, K.E.
—; Watkins, J.; Hill, C.G., Jr.: Hydrolysis of Menhaden Oil by a *Candida cylindracea* Lipase Immobilized in a Hollow-Fiber Reactor, 33
Robas, N. See Gschaedler, A., 712
Robert, J.M. See Vandanjon, L., 1
Robinson, A.S. See Foguel, D., 552
Robinson, C.R. See Foguel, D., 552
Rodriguez, B. See Dowd, J.E., 484
Rodríguez-Valera, F. See López-López, A., 79
Rossignol, N. See Vandanjon, L., 1
Ru, M.T.
—; Dordick, J.S.; Reimer, J.A.; Clark, D.S.: Optimizing the Salt-Induced Activation of Enzymes in Organic Solvents: Effects of Lyophilization Time and Water Content, 233
Rubio-Fernández, H. See Fregapane, G., 141

Saarinen, M.A.
—; Troutner, K.A.; Gladden, S.G.; Mitchell-Logean, C.M.; Murhammer, D.W.: Recombinant Protein Synthesis in *Trichoplusia ni* BTI-Tn-5B1-4 Insect Cell Aggregates, 612
Salvador, M.D. See Fregapane, G., 141
San, K.-Y. See Aristidou, A.A., 737

Sasisekharan, R. See Ameer, G.A., 618
Sasvári, Z.
—; Asbóth, B.: Crosslinking of Glucoamylases via Carbohydrates Hardly Affects Catalysis but Impairs Stability, 459
Schimmelpennink, E.B. See Marchal, L.M., 344
Schlieker, H. See Mayer, A.F., 373
Schreyer, H.B.
—; Coughlin, R.W.: Effects of Stratification in a Fluidized Bed Bioreactor During Treatment of Metalworking Wastewater, 129
Searles, J. See Muzzio, F.J., 185
Sekelsky, A.M.
—; Shreve, G.S.: Kinetic Model of Biosurfactant-Enhanced Hexadecane Biodegradation by *Pseudomonas aeruginosa*, 401
Shiloach, J. See Noronha, S.B., 285
Shreve, G.S. See Sekelsky, A.M., 401
Shuler, M.L. See Donaldson, M., 255
Shumway, L. See Ergas, S.J., 431
Silva, J.L. See Foguel, D., 552
Sipkema, E.M.
—; de Koning, W.; Van Hylckama Vlieg, J.E.T.; Ganzeveld, K.J.; Janssen, D.B.; Beenackers, A.A.C.M.: Trichloroethene Degradation in a Two-Step System by *Methylosinus trichosporium* OB3b. Optimization of System Performance: Use of Formate and Methane, 56
Smets, B.F.
—; Fiefler, R.G.; Lendenmann, U.; Spain, J.C.: Kinetic Analysis of Simultaneous 2,4-Dinitrotoluene (DNT) and 2,6-DNT Biodegradation in an Aerobic Fluidized-Bed Biofilm Reactor, 642
Smith, P.J. See Kumar, G., 154
Soroush, M. See Tatiraju, S., 22
Spain, J.C. See Smets, B.F., 642
Spohr, A.B. See Christiansen, T., 147
Stephanopoulos, G. See Follstad, B.D., 675
Strange, P.G. See Hooker, A.D., 559
Strasser, A.W.M. See Mayer, A.F., 373
Stuart, D.M.
—; Mitchell, D.A.; Johns, M.R.; Litster, J.D.: Solid-State Fermentation in Rotating Drum Bioreactors: Operating Variables Affect Performance through Their Effects on Transport Phenomena, 383
Stuart, S.L.
—; Woods, S.L.; Lemmon, T.L.; Ingle, J.D., Jr.: The Effect of Redox Potential Changes on Reductive Dechlorination of Pentachlorophenol and the Degradation of Acetate by a Mixed, Methanogenic Culture, 69
Stuckey, D.C. See Doig, S.D., 601

Tatiraju, S.
—; Soroush, M.; Mutharasan, R.: Multi-Rate Nonlinear State and Parameter Estimation in a Bioreactor, 22
Thoma, M. See Beuse, M., 410
Thornhill, N.F. See Yeung, K.S.Y., 684
Tom, R. See Zeiser, A., 122
Tonova, K. See Lazarova, Z., 583
Tramper, J. See Marchal, L.M., 344
Troutner, K.A. See Saarinen, M.A., 612
Tseng, J.-H. See Chou, C.P., 263
Tsoka, S.
—; Holwill, I.; Hoare, M.: Virus-Like Particle Analysis in Yeast Homogenate Using a Laser Light-Scattering Assay, 290
Tsujimura, H. See Higashiyama, K., 442

Unger, D.R. See Muzzio, F.J., 185

Vaghjiani, J.D. See Yeung, K.S.Y., 684
Vakharia, V.N. See Hu, Y.-C., 721
van de Laar, A.M.J. See Marchal, L.M., 344
van den Heuvel, J.C. See Hellendoorn, L., 694
Van Hylckama Vlieg, J.E.T. See Sipkema, E.M., 56
van Loon, A.P.G.M. See Mayer, A.F., 373
van Ooyen, A.J.J. See Verdoes, J.C., 750
Vandanjon, L.
—; Rossignol, N.; Jaouen, P.; Robert, J.M.; Quéméneur, F.: Effects of Shear on Two Microalgae Species. Contribution of Pumps and Valves in Tangential Flow Filtration Systems, 1
Verdoes, J.C.
—; Misawa, N.; van Ooyen, A.J.J.: Cloning and Characterization of the Astaxanthin Biosynthetic Gene Encoding Phytoene Desaturase of *Xanthophyllomyces dendrorhous*, 750
Villadsen, J. See Jensen, N.B.S., 356
Viveros-García, T. See Lobo, R., 98
Vogel, J.H.
—; Kroner, K.-H.: Controlled Shear Filtration: A Novel Technique for Animal Cell Separation, 663
Voyer, R. See Zeiser, A., 122
Vunjak-Novakovic, G. See Obradovic, B., 197

Wagner, L.W. See Noronha, S.B., 285
Wang, D.I.C. See Follstad, B.D., 675
Wang, W. See Michon, T., 449
Watkins, J. See Rice, K.E., 33
Weber, I. See Dowd, J.E., 484
Wiesner, T.F See Iyer, M.S., 10
Wijffels, R.H. See Hellendoorn, L., 694
Willemot, R.-M. See Bousquet, M.-P., 730
—; See Dols, M., 308
Williams, R.D. See Jolicoeur, M., 224
Williams, T. See Yeung, K.S.Y., 684
Wood, H.A. See Donaldson, M., 255
Woods, S.L. See Stuart, S.L., 69

Yarmush, M.L. See Le Doux, J.M., 654
Yeung, K.S.Y.
—; Hoare, M.; Thornhill, N.F.; Williams, T.; Vaghjiani, J.D.: Near-Infrared Spectroscopy for Bioprocess Monitoring and Control, 684
Yu, C.-C. See Chou, C.P., 263

Zandstra, P.W.
—; Jervis, E.; Haynes, C.A.; Kilburn, D.G.; Eaves, C.J.; Piret, J.M.: Concentration-Dependent Internalization of a Cytokine/Cytokine Receptor Complex in Human Hematopoietic Cells, 493
Zeiser, A.
—; Bédard, C.; Voyer, R.; Jardin, B.; Tom, R.; Kamen, A.A.: On-Line Monitoring of the Progress of Infection in Sf-9 Insect Cell Cultures Using Relative Permittivity Measurements, 122
Zydney, A.L. See Menon, M.K., 298

Biotechnology and Bioengineering

Subject Index to Volume 63

Acceptor reaction, 308
Acetic acid fermentation, 141
Activated sludge, 507
ADH2, 285
Affinity chromatography, 322, 633
Affinity ligand, 633
Agarose bioreactor, 618
Aggregates, 473
Air pollution control, 418, 431
Albumin, 298
ALS, 737
AM fungi, 224
Amino acid-based surfactants, 333
Ammonia, 255
α-amylase, 344, 583
Amyloglucosidase, 694
Anaerobic, 363
Apoptosis, 529, 516
Arachidonic acid, 442
Aspergillus, 249
Aspergillus oryzae, 147

Bacillus licheniformis, 110
Baculovirus, 122, 255, 721
Baculovirus expression vector system, 612
BHK, 464
Biochemical reactor, 22
Biodegradation, 216, 401
Biofilm, 87, 175, 418
Biofilter, 175
Biofiltration, 418
Biogas reactors, 363
Biological treatment, 431
Biological trickling filters, 418
Biomimetic dye, 322
Bioprocess, 290
Bioprocess design, 493
Bioreactor, 87, 197, 216
Bioreactors, 185, 224
Bioseparation, 583
Biosorption, 116
Biosurfactant, 401
Biphenyl dioxygenase, 544
Blood detoxification, 618
Bubble column reactor, 141
α-butylglucoside, 730

Ca-alginate oxygen diffusivity, 593
Cadmium, 116
Candida antarctica, 502
Candida cylindracea, 33
Capacitance, 122
Capsule, 116
Carbohydrates, 363
Carbon disulfide removal, 98
Carotenoid, 750
κ-carrageenan, 625
Cartilage, 197
CDNA copy number, 464
Cell aggregates, 612
Cell culture, 516, 663, 675
Cell cycle, 410
Cell separation, 663
Central metabolism, 675
Cephalosporin C production, 593
Chemostat culture, 675
Chitosan, 154
Chlorogenic acid, 154
CHO cells, 559
Chondrocyte metabolism, 197
Circular dichroism (CD), 242
Citrobacter, 87
Co-immobilised systems, 694
Codigestion, 363
Combinatorial libraries, 633
Complementation, 750
Continuous culture, 410
Continuous fermentation, 712
Controlled shear filtration, 663
Cooling rate, 166
Covalent enzyme oligomers, 459
Crossflow, 663
Crosslinking, 449, 459
Culture conditions, 255
Cytokine depletion, 493

Daucus carota, 224
Dextransucrase, 308
Dichloromethane, 418
Diffusion, 625
Diffusion phenomena, 206
Discrete modes of oscillation, 410
Dissolved oxygen, 255, 442
Dityrosine, 449
DNA shuffling, 544
Downstream processes, 583
Dynamic light scattering, 290
Dynamic model, 418
Dynamic modelling, 694
Dynamic re-optimization, 10
Dynamic sparger, 141

E1B-19K, 529, 516
E. coli, 392, 712
Effectiveness factor, 593
Eicosapentaenoic (EPA) and docosahexaenoic (DHA) acid residues, 33
Electrochemical reactor, 79
Electrochemical wastewater treatment, 79
Electrostatic interactions, 298
EMP pathway, 356
Enantioselectivity, 502
Endomycorrhizae, 224
Environment, 255
Enzymatic, 316
Enzymatic amide and ester bond formation, 333
Enzyme, 154
Enzyme activation, 233
Enzyme inactivation, 273
Enzyme purification, 322, 583
Enzymes deposited onto supports, 333
Epoxidation, 601
Escherichia coli, 263
Escherichia coli, 705, 737
Esterification, 502, 730

Ethanol, 285
Ethanolic fermentation, 46
Expansion, 473
Experimental design, 46
Expression, 392
Expression system, 373
Extraction method, 356

Fed-batch, 705
Fed-batch fermentor, 10
Fermentation development, 373
Ferrous iron oxidation, 79
Flourescence-assisted carbohydrate electrophoresis, 255
Flow cytometry, 705
Fluidized bed, 618

gapA gene, 712
GAPDH, 712
Gel-immobilised cells, 625
Gene dosage, 464
Gene expression, 263
Gene therapy, 654
Genetic manipulation, 263
Glomus intraradices, 224
Glucoamylase, 459
Glucose isomerase, 273
Glucose isomerization, 273
β-glucosidase, 392
Glycolysis, 356
Glycosylation, 255
Growth conditions, 473
Growth kinetics, 147

Hairy roots, 224
Hansenula polymorpha, 373
Heat shock, 516
Hematopoietic cells, 493
Heparin neutralization, 618
Heparinase, 618
Heterologous expression, 750
Hexadecane, 401
High cell density, 705
High cell-density cultivation, 373
Hollow-fiber bioreactors, 484
Hollow fiber membranes, 431
Hollow-fiber reactor, 33
HPAE-PAD, 356
Human secreted alkaline phosphatase, 255
Hybridoma, 529, 516
Hydrolysis, 33
Hydrostatic pressure, 552

Ibuprofen, 502
Immobilized cells, 87, 593
Immobilized lipase, 33
Immobilized metal affinity chromatography (IMAC), 721
Inclusion body, 552
Indole, 625
Inducible expression, 516
Infectious bursal disease virus (IBDV), 721
Inhibitors, 46
Inoculation conditions, 473

Insect, 255
Insect cells, 122, 559, 612
Interaction effects, 46
Interferon, 559
Ion binding, 298

Kinetic model, 308, 401
Kinetics, 69, 273

L-serine, 625
L-tryptophan, 625
Lactate dehydrogenase, 322
Lactococcus lactis, 356
Ligand design, 322
Lipase, 233, 502, 730
Lipids, 363
Low-cost protein production, 373
Lyophilization, 166, 233
Lysozyme, 242

Maize, 392
Malaria, 285
Maltose, 308
Mammalian cells, 675
Mammalian neural stem cells, 473
Mass spectrometry, 559
Mathematical model, 363
Membrane bioreactor, 601
Membrane integrity, 705
Membrane potential, 705
Menhaden oil, 33
Metabolic flux, 675
Metabolic flux analysis, 737
Metabolic model, 507
Metal accumulation, 87
Methylosinus trichosporium OB3b, 56
Microalgae, 1
Microcosms, 175
Microfiltration, 663
Mixing, 185
Model, 98
Model re-parametrization, 10
Modeling, 431
Molecular modeling, 322
Molecular weight distribution, 344
Monitoring, 684
Monoclonal antibodies, 484, 529
Monte Carlo simulation, 147
Morphology, 147, 442
Mortierella alpina, 442
MRNA level, 464
Multi-rate measurements, 22
Mutant, 249
Myeloma, 529, 516

N-glycosylation, 559
NAPL reduction, 401
NIR spectroscopy, 684
Non-conventional media, 730
Nuclear magnetic resonance (NMR), 242
Nucleotide sugars, 559

Oat, 392
1,7-octadiene, 601
Oligosaccharide, 308
On-line monitoring, 122
OPH, 216
Optimizing protein secretion, 373
Organic media, 333
Organic solvents, 233, 242, 449
Oxygen, 197

P22 tailspike, 552
Papain, 333
Parameter estimation, 22
Particle settling, 185
Penicillin acylase, 263
Penicillium, 249
Pentachlorophenol, 69
Peptide, 633
Peptide synthesis, 316
Perfusion, 484, 529
Permittivity, 122
Peroxidase, 449
Pesticides, 216
PET21, 392
PH regulation, 507
Phase separation, 166
Phosphatase, 87
Phosphorus removal, 507
PLS, 684
Poly(γ-glutamic acid) (PGGA), 110
Polychlorinated biphenyls (PCBs), 544
Polymer modification, 154
Predictive control, 484
Process monitoring, 22
Process–model mismatch, 10
Product specificity, 344
Propagules, 224
Proteases, 316
Protein aggregation, 552
Protein extraction, 583
Protein folding, 552
Protein purification, 721
Protein separations, 298
Protein stability, 166
Proteins, 363
Proteins dissolved in nonaqueous solvents, 242
Pseudomonas oleovorans, 601
Pumps, 1

Random mutagenesis, 544
Rapid monitoring, 290
Rate controlling step, 98
Reaction-diffusion model, 593
Real-time implementation, 22
Receptor internalization, 493
Recombinant DNA, 712
Recombinant DNA technology, 263
Recombinant protein production, 464
Recombinant retroviruses, 654
Redox potential, 69
Reductive dechlorination, 69
Resolution, 502
Retransfection, 464
Reversed micelles, 583
Rheological measurements, 206
Roller bottles, 185
Rotating drum bioreactor, 383

Saccharide composition, 344
Saccharomyces, 285
Saccharomyces cerevisiae, 410
Salts, 233
Secretion, 464, 559
SEM, 175
Sensor, 285
Shear effects, 1
Shear stress, 663
Simulation, 363
Single hyphae, 147
Size-exclusion HPLC, 552
Sodium alginate, 206
Sodium butyrate, 464
Sodium hyaluronate, 206
Solid phase extraction, 356
Solid-state fermentation, 383
Solid-to-solid conversion, 316
Soluble peptide library, 633
Sorghum, 392
Spores, 224
Spray freeze drying, 166
Stability, 694
Staggered extension process, 544
State estimation, 22
Structure, tertiary and secondary, 242
Subsite map, 344
Substrate protection, 273
Subtilisin Carlsberg, 233
Suspension bioreactor, 473
Sustained oscillation, 410

Tangential flow filtration, 1
Taylor-Couette flow, 618
TBV25H, 285
Temperature, 255, 344
Thermostability, 459
Thiobacillus ferrooxidans, 79
Time of harvest, 255
Tissue engineering, 197
Toluene biodegradation, 175
Transduction efficiency, 654
Transformation capacity, 56
Transglycosylation, 344
Transport phenomena, 383
Triazine dye, 322
Trichloroethene, 56
Trickle-bed bioreactor, 98
Trypsin, 333
Two-step bioreactor system, 56
Tyrosinase, 154

Ultrafiltration, 298, 721
Ultrasonic degradation, 110
Unsaturated fatty acid, 730
Uptake mechanism, 401

Valves, 1
Verbenol, 249
Vesicles, 224
Viability, 705
Virus decay, 654
Virus-like particle, 290
Virus-like particles (VLP), 721
Virus production, 654
Virus titer, 654
Volatile organic compounds, 431

Waste gas treatment, 418
Water activity, 502
Wheat prolamines, 449
Wine vinegar production, 141

Yeast, 46, 750

Zoogloea ramigera, 116
Zymomonas mobilis, 694